



# Efficacy of Different Fungicides Against Brown Rust of Wheat in Pakistan Punjab Province

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## Authors' contributions

This work was carried out in collaboration among all authors. Author AR conceived the idea of Research. Authors MAH and MN collected and compiled the literature. Authors MN, MTA, JA and ZA helped in performing the experiment. Authors AR and MAH wrote the manuscript and guided the authors and edited the manuscript. All authors proofread the script. All authors read and approved the final manuscript.

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## ABSTRACT

Wheat (*Triticum aestivum* L.) is one of the major crop grown in about all part of the world. In Pakistan wheat is one of the major cash crop. In Pakistan Punjab province is the major producer of high quality wheat crop. Wheat are attacked by many different pathogen including Bacterial, Viral and fungal pathogens and they cause a great losses in yield and quality of wheat. Specially the Brown rust which caused by *Puccinia triticina* is one of the major disease attacking wheat crop in open field. The aim and objective of this study is to determined the efficacy of different fungicide which are mostly used in Pakistan and study which fungicide is most efficient against brown rust of

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wheat. This experiment was conducted at Plant Pathology Research Institute, Ayub Agricultural Research Institute, Faisalabad, Pakistan . Experiment was laid out in RCBD in 3Replication . And the wheat variety which is used for this study is Akbar-19. Which is the most popular and widely growing variety in Punjab Pakistan . The commonly available and widely used Fungicide I.e Tilt, Amistar top, Belanty, Epic are used in this experiment to check which one is more efficient. Tilt fungicide shows great result against brown rust.

**Keywords:** *Triticum aestivum* L; brown rust; pest and diseases; efficacy of fungicide; wheat; pyraclostrobin.

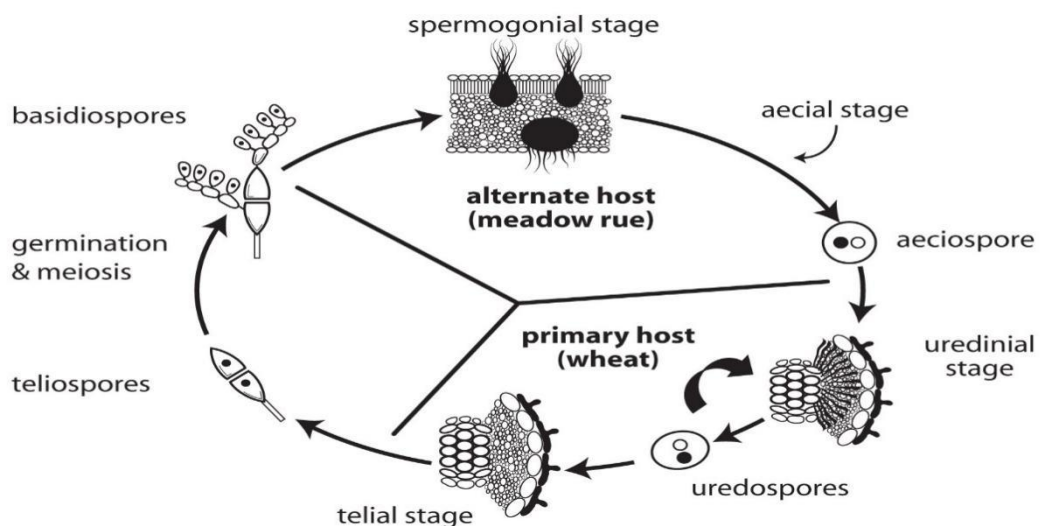
## 1. INTRODUCTION

Wheat is one of the most essential cereal crop grown worldwide [1] and thought that it is the first crop ever to be cultured and its play an important role in human's economic and social improvement worldwide [2]. Wheat is major cereal crop which plays an important role in feeding a starved planetary and rising global food security [2].Wheat (*Triticum aestivum* L) is the most widely grown cereal crop in Pakistan due to its holding, uses of grains and husk. Growth in yield is an alpha national goal to come across the constant increasing food's need. In Pakistan wheat was grown on an area of 8693 thousand hectares with yield production is about 24.2 million tones [4]. Brown rust disease of wheat, caused by *Puccinia triticina* Eriks. has always been one of the leading restraint in wheat production. It causes huge yield losses that could reach 50% sometime. Leaf rust happen more regularly and in more planetary regions than

stem rust of wheat (*P. graminis* f. sp. *tritici* ) or stripe rust of wheat(*P. striiformis* f. sp.*tritici* ). The pathogen is heteroecious, and Hence needs a telial/uredinial host (usually wheat) and an secondary (pycnial/aecial) host (Isopyrum fumaroides or *Thalictrum speciosissimum* ) to sheer the full life cycle. It therefore seems likely that the *P. triticina* area of beginning is the Potent Crescent region of the Middle East, where the natural range of the particular and alternative hosts overlap [5].Rusts diseases causes upto 60 and 100% loss of wheat yield by leaf or stripe (yellow) rust and stem rust, respectively, [6].

*Puccinia triticina* is a macrocyclic and heteroecious rust fungi having five spore phase and two hierarchy unrelated host species. Urediniospores produced on wheat hosts are dikaryotic, and the width are 20 µm [7]. Wheat brown rust dispersed via airborne spores. the complete life cycle of this pathogen is shown in Fig 1.

LIFE CYCLE OF *Puccinia triticina*



**Fig. 1. Leaf rust life cycle showing both primary and alternate hosts**

Graphic by Jerry Downs. Adapted from C.J. Alexopoulos, C.W. Mims, and M. Blackwell. 1996. *Introductory Mycology*, 4th ed. John Wiley and Sons, Inc.

In the life cycle of this fungus five types of spores are formed Urediniospores, teliospores, and basidiospores germinate on wheat plants and pycniospores and aeciospores germinate on the secondary hosts [8] . The growth process requires wetness, and works best at 100% humidity. Optimal temperature for germination is betwixt 15–20 °C (59–68 °F). Before sporulation, wheat plants appear completely asymptomatic.

Managing this disease can be challenging, there are effective strategies available to control the disease various fungicides have been tested for their effectiveness in managing this disease [9],.

## 2. MATERIALS AND METHODOLOGY

Experiment was laid out in RCBD in three replication at Plant Pathology Research Institute , AARI,Faislabad. Plot size was kept 3x2 meter square. For evaluation of fungicide, wheat variety “Akbar-19” was grown under Randomized complete block (RCBD) design . Standard

Agronomic practiced were adopted to raise the crop under natural condition [10-11]. layout plan of the experiment is also mentioned in the Table 1.

### 2.1 Treatments

Wheat variety “Akbar-19” was grown under natural environmental conditions under Randomized complete block (RCBD) design. All fungicides are applied as oer recommendation .Two sprays with the test fungicide was carried out after 10 days interval.

## 3. RESULTS AND DISCUSSION

These result are taken during experiment are mentioned in Table 3 .

Efficacy of fungicide is based on proper and timely application to get more effectiveness and overall control over level of disease in the field at the time of application. The highest disease

**Table 1. Number of replications and treatments (Layout Plan)**

Replications	Treatments					
R3	T1	T5	T3	T4	T2	T6
R2	T4	T6	T5	T1	T3	T2
R1	T2	T5	T1	T3	T6	T6

**Table 2. Treatment, Fungicide trade name with active ingredients and dose per L**

Treatment no	Trade name	Composition	Dose
T1	Tilt	(Propiconazole)	2ml/L
T2	Amistar Top	(Azoxystrobin+Difenoconaz )	2ml/L
T3	Epic	(Epoconazole)	4ml/L
T4	Belanty	(Mefentrifluconazole)	1.5ml/L
T5	Pyraclors + epoxico	(Pyraclostrobin+epoxiconazole)	3ml/L
T6(UnTreatment Controlled)	Untreated Control	Nil	Nil

*Following data on the parameter were recorded as per AARI recommendation*

**Table 3. After application of fungicides the % disease incidence and disease decrease over control**

Treatment no	Trade name	Composition	Disease Incidence (%)	%age Disease decrease over control
T1	Tilt	(Propiconazole)	9.8%	88.9%
T2	Amistar Top	(Azoxystrobin +Difenoconaz)	14.7%	83.4%
T3	Epic	(Epoconazole)	15%	83.1%
T4	Belanty	(Mefentrifluconazole)	17%	80.3%
T5	Pyraclors + epoxico	(Pyraclostrobin+epoxiconazole)	29.5%	66.8%
T6(UnTreatment Controlled)	Un-Treated controlled		89%	66.8%



**Fig. 2. (Treated)**



**Fig. 3. (Un treated)**

incidence % is 89% which recorded in un Treatment controlled environment. T1(Tilt) give maximum decrease over control (88.9%). and other fungicide also show some effective response but the Tilt is Recommended because its shows the highest efficacy rate. The difference between untreated and treated can be seen in the lower mentioned Fig. 2&3 [12-13].

#### 4. CONCLUSION

the fungicide expressed significant results as compared to untreated control. Among all treatments , Tilt gave maximum decrease over control(88.9%). The second most effective treatment was Amistar top which gives (83.4%) disease decrease over control. On the 3<sup>rd</sup> the Epic was effective which reduced the disease level upto (15%) with (83.1%) disease decrease over control . While Belanty gives (80.3%) disease over control. On the other hand Pyraclostrobin+epoxiconazole not gives good result as compared to other fungicide. After studying and analyzing the result it is easy to said that Tilt is the most effective fungicide used against the brown rust , which helps to control brown rust and help to increase the crop yields by reducing yield loss that is caused by *Puccinia triticina*.

#### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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